

Ultraviolet (UV) Radiation

Examples of Health Impacts

- Sunburn and Skin Cancer
- Eye Cataracts
- Suppression of the Immune System
- Premature Aging of the Skin
- Plant Damages/Crop Yields
- Disruption of Food Chain (Land and Ocean)
- Effects on Insect Population (*UV Kills Larvae*)

Mechanisms Causing Health Effects

Ultraviolet (UV) light rays reaching the Earth's surface = the damaging component in sunlight (400 nm - ~290 nm)

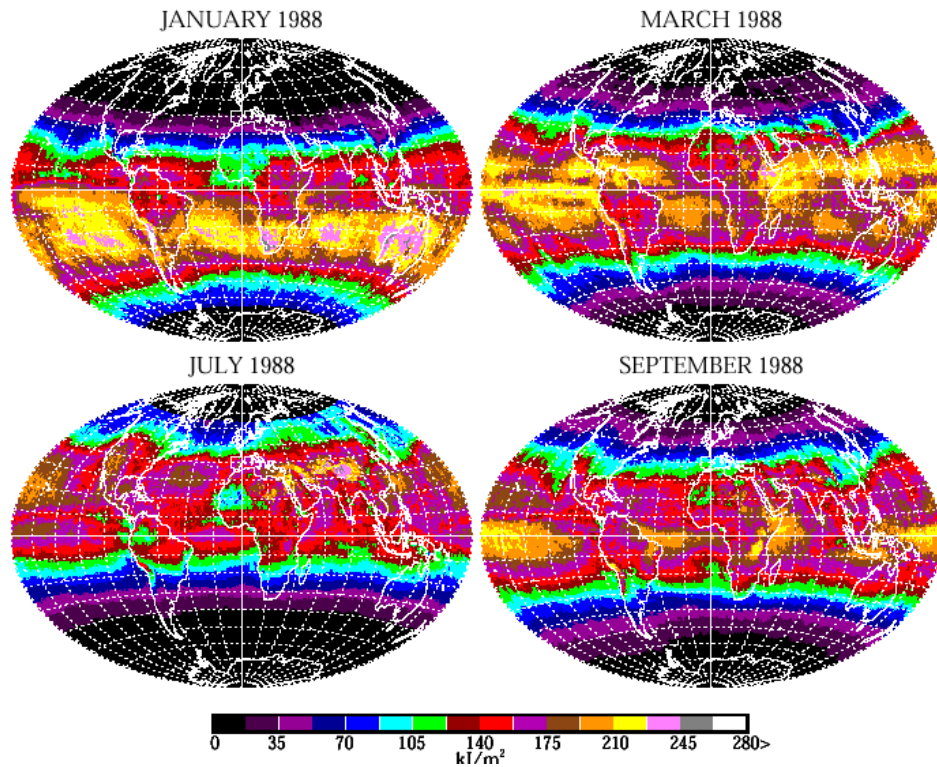
- Most UV light between 290 and 315 nm is absorbed by the ozone layer
- Longer UV radiation partially reflected back into space
- Therefore, only a fraction reaches the surface of the Earth

The UV radiation that reaches the ground level can cause serious health problems.

3 types of UV Radiation:

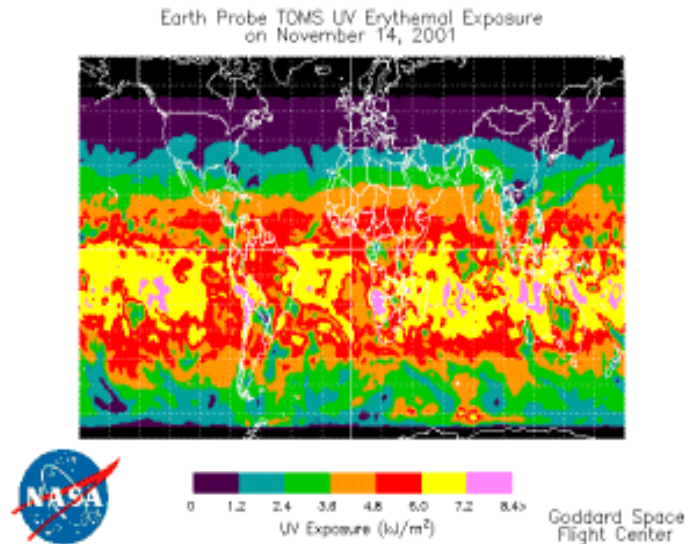
- U-B (290-315 nm)- mostly shielded by atmospheric ozone layer
- causes the most dangerous form of damages to living organisms and materials, e.g., plastic
- UV-A (315-400 nm)- not absorbed by ozone layer
- has less severe biological effects
- UV-C (220-290 nm)- strongly absorbed in atmosphere (never reaches earth)

Stratospheric ozone depletion leads to an increase in UV-B at Earth's surface



The geographic distribution of monthly-averaged UV irradiance from 290 to 400 nm weighted by the CIE erythral action spectra. Season, cloud attenuation, and ozone attenuation are the main causes for geographical differences. Of note are the much higher levels of summertime UV irradiance in the southern hemisphere compared to the northern hemisphere at the same latitude (see January in Australia and July in the US). The reason is mostly due to much lower cloud amount in the southern hemisphere and to slightly lower ozone amounts.

http://toms.gsfc.nasa.gov/ery_uv/euv.html



Example of TOMS global image of daily erythemat UV exposure.

This is an example of TOMS global image of daily erythemat UV exposure. Ultraviolet radiation exists to the left of the visible spectrum and is divided into three components (UV-A, UV-B and UV-C). UV-B (290-320 wavelengths) is the most dangerous form of UV radiation that can reach ground level. Atmospheric ozone shields life at the surface from most of the harmful components of solar radiation. Chemical processes in the atmosphere can affect the level of protection provided by the ozone in the upper atmosphere. This *thinning* of the atmospheric ozone in the stratosphere leads to elevated levels of UV-B at ground level and increases the risks of [DNA damage](#) in living organisms.

Data Availability

NASA/GSFC TOMS web site (http://toms.gsfc.nasa.gov/ery_uv/euv.html)

- Data is available from November 1978 to March 1993 and from July 25, 1996 to present
- Data output available as data file or global image

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